(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 595 779 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
19.04.2000 Bulletin 2000/16

(51) Int. Cl.[7]: **A47K 10/38**, B65D 83/08

(21) Application number: **93850154.1**

(22) Date of filing: **10.08.1993**

(54) Dispensing nozzle

Spenderdüse

Buse de distribution

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB GR IE IT LI LU MC NL PT SE

(30) Priority: **11.08.1992 US 928059**

(43) Date of publication of application:
04.05.1994 Bulletin 1994/18

(73) Proprietor:
SCA Hygiene Products AB
405 03 Göteborg (SE)

(72) Inventors:
- **Temesvary, Louis**
  Sunnyvale, California 94087 (US)
- **Leizgold, Enrique**
  Danville, California 94526 (US)

(74) Representative:
Kierkegaard, Lars-Olov et al
Albihns Patentbyra Stockholm AB,
Box 5581
114 85 Stockholm (SE)

(56) References cited:
GB-A- 677 336
NL-A- 8 202 693
US-A- 1 545 182

EP 0 595 779 B1

Description

Background of the Invention

1. Field of the Invention

[0001] The present invention relates to a dispensing nozzle for a towel dispenser, the nozzle being adjustable so as to accommodate towels of different thicknesses.

2. Discussion of Related Art

[0002] Paper towels have many uses and are commonly used or cleaning and drying various surfaces. Typically, the towels will come from the manufacturer in a rolled or folded configuration, with or without perforations. Whether the towels are in a perforated format or nonperforated format, the tearing of the towels is not precise, resulting in unnecessary discard of partially torn towels or the extra towels used. Thus, it has become common practice for towel dispensers to contain sharp or tensioned edges to ease the user in the tearing process.

[0003] Several towel dispensers providing structures for separating the towel from the web have been patented. US-A-4,905,868, forming the basis for the preamble of the independent claim, discloses a dispenser nozzle, along with an exit aperture, for a paper towel dispenser for accurately and reliably dispensing individual towels from a continuous web of towels. The nozzle has a conical shape for passing the paper towels therethrough, and causing each paper towel to be compressed as it moves through the nozzle. As a result, the friction between the paper towel and the inside of the nozzle eventually causes the dispensed paper towel to be separated from the web of towels. Furthermore, the diameter of the exit aperture of the nozzle may be enlarged in order to accommodate thicker paper towels. To enlarge the exit aperture of the nozzle, an operator removes the tip of the nozzle by cutting, clipping or breaking. Once the operator enlarges the exit aperture, the same nozzle cannot be narrowed to accommodate a thinner towel. Thus, to narrow the exit aperture of the nozzle, the operator must replace the old nozzle portion with a new nozzle portion.

[0004] Other examples of patented towel dispensers include: US-A-4,648,530 disclosing a dispenser for perforated precut folded or rolled towels and, US-A-4,387,832 disclosing a dispenser for pre-moistened perforated towels.

[0005] While each of the above described towel dispensers function adequately, they each have drawbacks. The major drawback is that the dispenser requires that the towels be perforated, thus providing an additional cost due to the manufacturing of the towel. Furthermore, the nozzle according to US-A-4,905,868, while not requiring the extra cost of perforated towels, achieves an extra expense in necessitating a replacement nozzle to accommodate a thinner towel.

[0006] Therefore, what is desirable is a dispenser with a nozzle having a durable exterior capable of tearing towels, to be fitted to a paper towel container for accurately dispensing paper towels without unnecessary discarding, wherein the exit aperture of the nozzle is adjustable according to the thickness of the towel.

[0007] An adjustable nozzle for a dispenser is known from GB-A-677 336. This prior art nozzle is provided on a bottle or a collapsible tube and can be used to regulate the flow of liquid therefrom. However, there is no mention that a development of the disclosed nozzle could be used with a towel dispenser. The known nozzle also has the disadvantage that there is no provision for ensuring that the aperture size set by the fixture is maintained during subsequent use of the dispenser. This is important for a towel dispenser where the set aperture size should remain unchanged until the dispenser is to be used with towels of different thickness.

Summary of the Invention

[0008] It is therefore an object of the present invention to provide an adjustable dispenser nozzle for use with a towel dispenser.

[0009] Furthermore, it is a further object of the invention to provide an adjustable nozzle, which can be adjusted to enlarge or decrease the size of the exit aperture for dispensing the towel, with means for maintaining the aperture at the adjusted size during subsequent use.

[0010] In accordance with the invention, there is provided a dispensing nozzle according to the subject-matter of independent claim 1.

[0011] Preferred embodiments of the dispensing nozzle according to the invention are specified in the dependent claims 2 to 9.

Brief Description of the Drawings

[0012] The present invention will now be described in detail with reference to the attached drawings, in which:

Fig. 1 is a sectional view of an adjustable dispenser nozzle according to the present invention in a fully open position;

Fig. 2 is a sectional view of an adjustable dispenser nozzle according to the present invention in a thread-start position;

Fig. 3 is a sectional view of an adjustable dispenser nozzle according to the present invention in a fully narrowed position; and

Fig. 4 is a top view of an adjustable dispenser nozzle according to the present invention.

Detailed Description of the Preferred Embodiments

[0013] Paper towels are dispensed from a number of different types of containers. Some containers are designed for dispensing precut or z-folded towels. Other containers are designed for dispensing towels, wherein the dispensed towels are pulled from either the inside or outside of a roll.

[0014] Although the disclosed invention may have broad applicability, it relates primarily to a nozzle for a dispenser adapted to dispense towels from the inside of a continuous roll. The dispenser may include a box-like structure, comprised of either metal or a plastic material, having an aperture in the center of the bottom thereof. A nozzle is fitted within the aperture in order to facilitate separating the towel from the web of towels in the dispenser, and furthermore to facilitate removal of the towels from the dispenser.

[0015] Fig. 1 illustrates a novel adjustable nozzle 10 for such a towel dispenser. The dispenser nozzle 10 includes a base 20 having a conical portion 21 therein. The conical portion 21 defines a channel 15 through which towels (not shown) are pulled as they are dispensed. Additionally, the conical portion 21 has a narrow end 23 defining an aperture 6b. The towels exit the dispenser nozzle 10 through the channel 15 and the aperture 6b.

[0016] In a preferred embodiment, the conical portion 21 of the base 20 includes a plurality of extensions 8 that are defined and separated by substantially parallel slits 9. These slits 9 impart an elastic characteristic to the conical portion 21. Furthermore, the conical portion 21 has a bottom edge 7b upon which the towels may be torn as they are dispensed from the dispenser nozzle 10.

[0017] The base 20 further includes an outer wall 30 for engaging the towel dispenser. The outer wall 30 includes a curved bottom 31 at one edge thereof. In addition, the outer wall 30 includes a rim 32A from which extend a plurality of tabs 32B for securing the base 20 to the towel dispenser. The rim 32A extends perpendicularly from the outer wall 30, and the tabs 32B are parallel to and extend outwardly from the rim 32A.

[0018] Turning attention to Fig. 3, the towel dispenser includes an outer wall 3 having a surface 4. The surface 4 includes a plurality of platforms 4A. The platforms 4A engage with the tabs 32B of the nozzle 10. When the dispenser nozzle 10 is attached to the towel dispenser, the rim 32A remains outside of the towel dispenser. The tabs 32B of the outer wall 30 provide a contact between the towel dispenser and the dispenser nozzle 10.

[0019] The curved bottom 31 of the base 20 is used as a gripping surface when replacing the dispenser nozzle 10. The dispenser nozzle 10 may be replaced by rotating the nozzle 10 so that the tabs 32B are free from the platforms 4A, and then pulling the dispenser nozzle 10 in a direction away from the towel dispenser.

[0020] The base 20 of the dispenser nozzle 10 may be comprised of an elastomeric material. In a preferred embodiment the material is a hard rubber known as ABS. However, instead of ABS, the base may be made from another material having a similar quality and characteristic. Due to the combination of the plurality of slits 9, the extensions 8 and the elasticity provided by the ABS, narrowing and expanding the exit aperture 6b of the base 20 is enabled.

[0021] The base 20 includes an interior wall 27 (see Fig. 2) having an exterior surface 22b and an interior surface 22a. The exterior surface 22b of the base 20 is threaded so as to receive a fixture, such as a collar 40 or a nut. The collar 40 includes a reciprocatingly threaded interior wall 45. Thus, the collar 40 may be threaded onto the threaded exterior surface 22b of the base 20 in a manner similar to attaching a nut to a bolt.

[0022] The collar 40 further includes a conical projection 41. The conical projection 41 protrudes inwardly toward the channel 15. The conical projection 41 also includes a bottom edge 7f having an aperture 6f therein, through which the towels pass as they are dispensed from the dispenser nozzle 10. When the extensions 8 of the base 20 do not protrude beyond the bottom edge 7f of the conical projection 41, the bottom edge 7b of the base 20 provides a suitable surface upon which the towels may be torn as they are dispensed.

[0023] The extensions 8 of the base 20 are located within the conical projection 41 of the collar 40. Furthermore, the exit aperture 6f the collar 40 is concentric with the exit aperture 6b of the base 20. Thus, the exit aperture 6f of the collar 40 together with the exit aperture 6b of the base 20, combine to form an exit aperture 70 of the dispenser nozzle 10. In addition, the conical projection 41 of the collar 40, together with the conical portion 21 of the base 20 define the channel 15 through which the towels pass as they are dispensed.

[0024] The collar 40 further includes a shoulder 48 (Fig. 1) adjacent the threaded interior wall 45 of the collar 40. In addition, the base 20 includes a corresponding shoulder 38 adjacent the threaded exterior surface 22b of the interior wall 27. The shoulder 38 of the base 20 extends in a perpendicular direction away from the threaded exterior surface 22b, and is parallel to the shoulder 48 of the collar 40. When the collar 40 is completely threaded onto the exterior wall 22b of the base 20, there is a distance N between the shoulder 38 of the base 20 and the shoulder 48 of the collar 40.

[0025] The shoulder 48 of the collar 40 includes a plurality of apertures 44 extending therethrough (see figs. 1 and 2). Additionally, the shoulder 38 of the base 20 includes a plurality of similar apertures 24 extending therethrough. See Fig. 4. Both the apertures 24 of the shoulder 38 and the apertures 44 of the shoulder 48 are adapted to receive a locking means, such as a set screw 60. Thus, when the collar 40 has been threaded onto the base 20 to the extent necessary to achieve a desired width of the exit aperture 70, the apertures 24

and 44 are aligned and the set screw 60 may be inserted through the respective apertures 24 and 44, to maintain the exit aperture 70 at the desired width.

[0026] The collar 40 further includes a plurality of teeth (not shown) comprised of a flexible material. The teeth extend perpendicularly from the shoulder 48 of the collar 40 toward the outer wall 30 of the base 20. Turning attention to Fig. 4, the dispenser nozzle 10 further includes a plurality of slotted openings 77. The slotted openings 77 act as a spring mechanism to the teeth of the collar 40, thus allowing the teeth to flex inward toward the channel 15 as the collar 40 is adjusted.

[0027] The collar 40 may be comprised of an acetal material, providing the collar 40 with a semi-rigid characteristic. Preferably, the collar 40 is made from a material that is more rigid than the material from which the base 20 is made. However, instead of acetal, the collar may be made from another material of similar quality and character. Thus, due to the nature of the material, as the exit aperture 70 of the dispenser nozzle 10 is narrowed or expanded, the diameter C of the aperture 6f of the collar 40 remains relatively constant.

[0028] The dispenser nozzle 10 further includes a channel member in the form of a sleeve 50. See Fig. 3. The sleeve 50 includes a head 58, which rests flush against the interior surface 22a of the base 20. The sleeve 50 further includes a conical portion 51 having a smooth tapered surface, which lines the interior part of the channel 15. The conical portion 51 of the sleeve 50 extends along the length of the channel 15. Thus, when the sleeve 50 is mounted within the dispenser nozzle 10, the sleeve defines the channel 15 through which towels pass as they exit the towel dispenser. The conical portion 51 of the sleeve 50 is concentric with the extensions 8 of the base 20, the conical projection 41 of the collar 40, and the exit aperture 70.

[0029] Furthermore, the sleeve 50 includes an exit aperture 6s which limits the exit aperture 70 as the sleeve protrudes beyond the bottom edge 7f of the collar 40. This position is attained when the collar 40 is fully threaded onto the base 20. The sleeve 50 also includes a bottom edge 7s, upon which the towels may be torn as they exit the dispenser nozzle 10.

[0030] In a preferred embodiment, the sleeve 50 may be comprised of a thermoset rubber material, such as polyurethane. However, instead of polyurethane, the sleeve 50 may be made from another material having suitable and or similar quality. The material of the sleeve 50 enables it to expand or contract to accommodate adjustments made to the dispenser nozzle 10.

[0031] Figures 2 and 3 respectively illustrate the adjustable dispenser nozzle 10 in the "Thread-Start Position" and the "Fully Narrowed Position". In Fig. 2, the collar 40 is in a fully open position. Fig. 3 illustrates the dispenser nozzle 10 as the collar 40 is fully threaded onto the base 20, such that the shoulder 38 of the base 20 is within a small distance N of the shoulder 48 of the collar 40.

[0032] When the collar 40 is fully threaded onto the base 20, the bottom edges 7f, 7b and 7s of the collar 40, the base 20, and the sleeve 50, respectively, extend beyond the curved bottom 31 of the base 20. When the collar 40 is completely threaded onto the base 20, a maximum distance, defined as H, between the curved bottom 31 of the base 20 and primary exit aperture 70 is achieved.

[0033] Fig. 4 illustrates the adjustable dispenser from a top view. The dispenser apparatus comprises a plurality of platforms 75 to retain the collar 40 adjacent the base 20. In addition, the platforms 75 assist in aligning the apertures 44 of the collar 40 with the apertures 24 of the base 20. These platforms are shown maintaining the collar 40 within the dispenser apparatus when the dispenser nozzle 10 is in a fully-open position. The platforms 75 ensure that the collar 40 is not removed from the towel dispenser.

[0034] The base 20 further includes a plurality of notches 76 for the collar 40 to engage as it is further threaded onto the base 20. The notches 76 provide a secure yet flexible attachment of the collar 40 to the dispenser nozzle 10. In addition, the towel dispenser further includes a lock 80 for securing the nozzle 10 to the towel dispenser.

[0035] In a preferred embodiment, the dispenser nozzle 10 includes four platforms 75 and twelve positioning notches 76. However, the exact number of platforms 75 and notches 76 are not limiting. The dispenser nozzle 10 may include varying numbers of notches 76 and platforms 75 as long as they provide a similar or suitable function to the dispenser nozzle 10.

[0036] The towel dispenser (not shown) further includes an opening (not shown) through which the towels exit the towel dispenser and enter the dispenser nozzle 10. The distance between the opening of the towel dispenser and the nozzle 10 is defined as B, as shown in Fig. 3.

[0037] For purposes of completeness, specific dimensions of a preferred embodiment are set forth below. The following is a chart of the dimensions of the dispenser nozzle 10 in a Thread Start Position:

Item	Dimension mm (inches)
Diameter A	15.24 mm (0.600)
Distance F	10.16 mm (0.400)
Distance L	73.86 mm (2.908)
Distance M	108.2 mm (4.260)
Radius R	25.40 mm (1.00)

[0038] The following is a chart of the varying dimensions of the dispenser nozzle 10 in a Fully Closed Position:

Item	Dimension mm (inches)
Diameter D	7.16 mm (0.282)
Distance B	2.05 mm (0.081)
Distance G	10.31 mm (0.406)
Distance H	14.63 mm (0.576)
Distance J	5.76 mm (0.227)
Distance K	58.95 mm (2.321)
Distance L	73.86 mm (2.908)
Distance M	108.2 mm (4.260)
Distance N	1.19 mm (0.047)

[0039] Although the present invention has been described in connection with preferred embodiments thereof, it will be appreciated by those skilled in the art that additions, deletions, modifications, and substitutions not specifically described may be made without departing from the scope of the invention as defined in the appended claims.

Claims

1. A dispensing nozzle (10) for use with a towel dispenser (3), comprising: a base (20) which is attachable to the towel dispenser (3); a channel member (21;50) with an exit aperture (6b;6s) through which the towels pass as they exit the dispenser and which is adjustable in size; **characterized** in that a fixture (40) is mounted to the base (20) and adjustable to any of a plurality of operative positions with respect to the base for determining the size of the exit aperture, and in that means (76;24,44,60) are provided for retaining the fixture (40) relative to the base (20) in a selected one of said plurality of operative positions.

2. A nozzle as claimed in claim 1, **characterized** in that the retaining means comprises notches (76) on the base (20) and that the fixure (40) is engageable with the notches for determining said plurality of operative positions.

3. A nozzle as claimed in claim 2, **characterized** in that the notches (76) are provided on an inner surface of the base (20) and that the fixture (40) comprises a lateral shoulder (48) engageable with the notches (76).

4. A nozzle as claimed in claim 1, **characterized** in that the retaining means comprises apertures (24) in a flange (38) extending from the base (20) adjacent the channel member (21), apertures (44) in a lateral shoulder (48) on the fixture (49), and securing means (60) that fit through the aperture (24,22) so as to lock the fixutre to the base.

5. A nozzle as claimed in any of claims 1-4, **characterized** by matching threaded surfaces (22b,45) on the base (20) and the fixture (40) so that the fixure (40) may be threaded onto the base, and rotated to assume any of said operative positions.

6. A nozzle as claimed in any of claims 1-5, **characterized** in that the channel member (21) is formed on the base (20).

7. A nozzle as claimed in claim 6, **characterized** in that the channel member (21) adjacent the exit aperture (6b) includes axially extending slits (9) which enable the exit aperture (6b) to be contracted.

8. A nozzle as claimed in any of claims 1-5, **characterized** in that the base (20) includes a tubular member (21) having an outer end (23), which extends through the fixture (40) and has axially extending slits (9), and in that the channel member comprises a sleeve (50) forming a lining within the channel member (21).

9. A nozzle as claimed in any of claims 1-8, **characterized** in that the channel member (21;50) comprises a tear edge (7b;7s) adjacent the exit aperture (6b;6s) enabling the towels to be torn after exiting the exit aperture (6b,6s).

Patentansprüche

1. Spendermundstück (10) zur Verwendung mit einem Handtuchspender (3), mit einem Grundteil (20), das an dem Handtuchspender (3) anbringbar ist, einem Kanalelement (21; 50) mit einer Auslassöffnung (6b; 6s), durch die die Handtücher beim Verlassen des Spenders hindurchgehen und die in der Größe einstellbar ist, **dadurch gekennzeichnet, dass** eine Halterung (40) an dem Grundteil (20) angebracht ist und zur Festlegung der Größe der Auslassöffnung in irgendeiner von mehreren Betriebsstellungen gegenüber dem Grundteil einstellbar ist, und dass ein Mittel (76; 24, 44, 60) vorhanden ist, um die Halterung (40) relativ zum Grundteil (20) in einer von den mehreren Betriebsstellungen ausgewählten Stellung festzuhalten.

2. Mundstück nach Anspruch 1, **dadurch gekennzeichnet, dass** das Festhaltemittel Nuten (76) am Grundteil (20) umfasst und dass die Halterung (40) mit den Nuten in Eingriff bringbar ist, um die mehreren Betriebsstellungen festzulegen.

3. Mundstück nach Anspruch 2, **dadurch gekennzeichnet, dass** die Nuten (76) an der Innenseite des Grundteils (20) vorhanden sind und dass die Halterung (40) eine Seitenschulter (48) umfasst, die mit den Nuten (76) in Eingriff bringbar ist.

4. Mundstück nach Anspruch 1, **dadurch gekennzeichnet, dass** die Festhaltemittel Öffnungen (24) in einem sich von dem Grundteil neben dem Kanalelement (21) erstreckenden Flansch (38), Öffnungen (44) in einer Seitenschulter (48) an der Halterung (40) und Sicherungsmittel (60) umfasst, die durch die Öffnungen (24, 22) passen, um so die Halterung an dem Grundteil zu verriegeln.

5. Mundstück nach einem der Ansprüche 1-4, **gekennzeichnet durch** Zusammenbringen von mit einem Gewinde versehenen Flächen (22b, 45) an dem Grundteil (20) und der Halterung (40), so dass die Halterung (40) an dem Grundteil aufgeschraubt und gedreht werden kann, um eine der Betriebstellungen einzunehmen.

6. Mundstück nach einem der Ansprüche 1-5, **dadurch gekennzeichnet, dass** das Kanalelement (21) an dem Grundteil (20) angeformt ist.

7. Mundstück nach Anspruch 6, **dadurch gekennzeichnet, dass** das Kanalelement (21) neben der Auslassöffnung (6b) axial verlaufende Schlitze (9) enthält, die es ermöglichen, dass die Auslassöffnung (6b) verengt werden kann.

8. Mundstück nach einem der Ansprüche 1-5, **dadurch gekennzeichnet, dass** das Grundteil (20) ein rohrförmiges Element (21) mit einem Aussenende (23) enthält, das sich durch die Halterung (40) erstreckt und axial verlaufende Schlitze (9) besitzt, und dass das Kanalelement eine Hülse (50) umfasst, die innerhalb des Kanalelements (21) eine Auskleidung bildet.

9. Mundstück nach einem der Ansprüche 1-8, **dadurch gekennzeichnet, dass** das Kanalelement (21; 50) neben der Auslassöffnung (6b; 6s) eine Abreisskante (7b; 7s) umfasst, die es ermöglicht, die Handtücher nach dem Verlassen der Auslassöffnung (6b; 6s) abzureissen.

Revendications

1. Buse de distribution (10) à utiliser avec un distributeur de serviettes (3), comprenant une base (20) qui peut être fixée au distributeur de serviettes (3), un élément formant canal (21; 50) avec une ouverture de sortie (6b ; 6s) à travers laquelle passent les serviettes lorsqu'elles sortent du distributeur et dont la taille peut être réglée ; caractérisée en ce qu'un élément de montage (40) est monté sur la base (20) et peut être réglé dans l'une quelconque d'une pluralité de positions actives par rapport à la base pour déterminer la taille de l'ouverture de sortie et en ce que des moyens (76 ; 24, 44, 60) sont prévus pour retenir l'élément de montage (40) par rapport à la base (20) dans l'une sélectionnée de ladite pluralité de positions actives.

2. Buse selon la revendication 1, caractérisée en ce que les moyens de retenue comprennent des encoches (76) sur la base et en ce que l'élément de montage (40) peut venir en prise avec les encoches pour déterminer ladite pluralité de positions actives.

3. Buse selon la revendication 2, caractérisée en ce que les encoches (76) sont formées sur une surface intérieure de la base (20) et en ce que l'élément de montage (40) comprend un épaulement latéral (48) pouvant coopérer avec les encoches (76).

4. Buse selon la revendication 1, caractérisée en ce que les moyens de retenue comprennent des ouvertures (24) dans un rebord (38) s'étendant depuis la base (20) de façon adjacente à l'élément formant canal (21), des ouvertures (44) dans un épaulement latéral (48) sur l'élément de montage (40), et des moyens de fixation (60) qui s'insèrent à travers l'ouverture (24, 22) de manière à verrouiller l'élément de montage à la base.

5. Buse selon l'une quelconque des revendications 1 à 4, caractérisée par des surfaces filetées correspondantes (22b, 45) sur la base (20) et sur l'élément de montage (40) de sorte que l'élément de montage (40) peut être vissé sur la base, et tourné pour adopter l'une desdites positions actives.

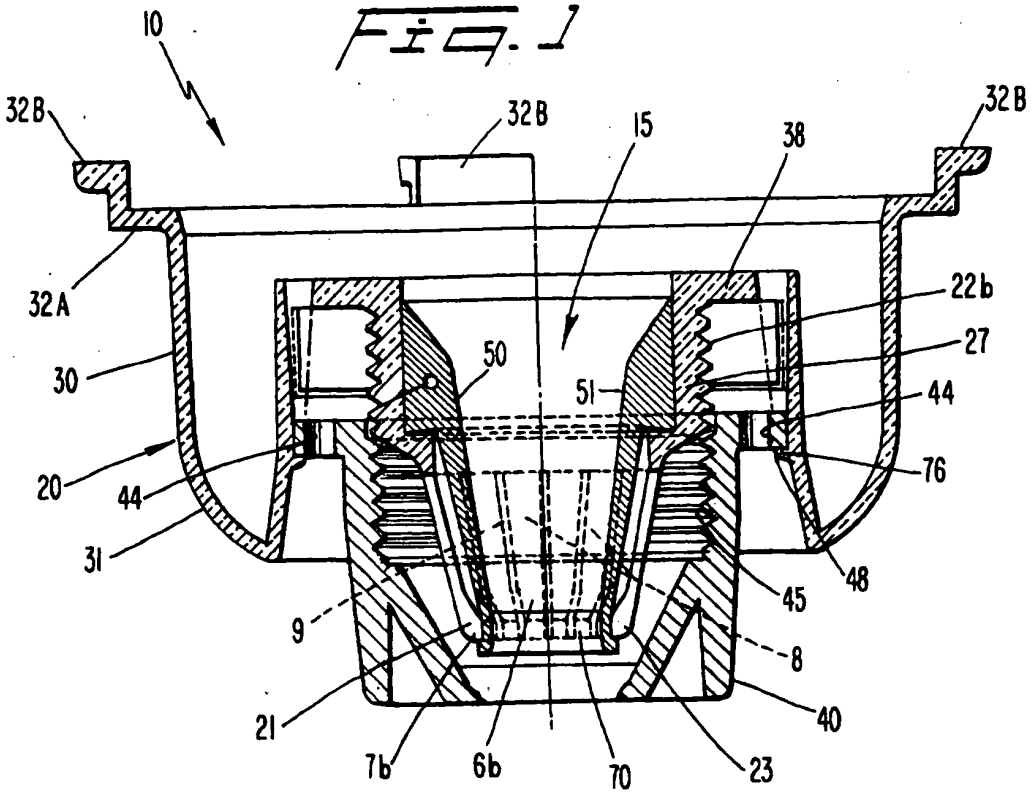
6. Buse selon l'une quelconque des revendications 1 à 5, caractérisée en ce que l'élément formant canal (21) est formé sur la base (20).

7. Buse selon la revendication 6, caractérisée en ce que l'élément formant canal (21) adjacent à l'ouverture de sortie (6b) comprend des fentes (9) qui s'étendent axialement et permettent à l'ouverture de sortie (6b) d'être resserrée.

8. Buse selon l'une quelconque des revendications 1 à 5, caractérisée en ce que la base (20) comprend un élément tubulaire (21) ayant une extrémité extérieure (23) qui s'étend à travers l'élément de montage (40) et comporte des fentes (9) s'étendant axialement, et en ce que l'élément formant canal comprend un manchon (50) formant une garniture à l'intérieur de l'élément formant canal (21).

9. Buse selon l'une quelconque des revendications 1 à 8, caractérisée en ce que l'élément formant canal (21 ; 50) comprend un bord de déchirage (7b ; 7s) adjacent à l'ouverture de sortie (6b ; 6s) permettant aux serviettes d'être déchirées après qu'elles sortent de l'ouverture de sortie (6b ; 6s).

Fig. 1



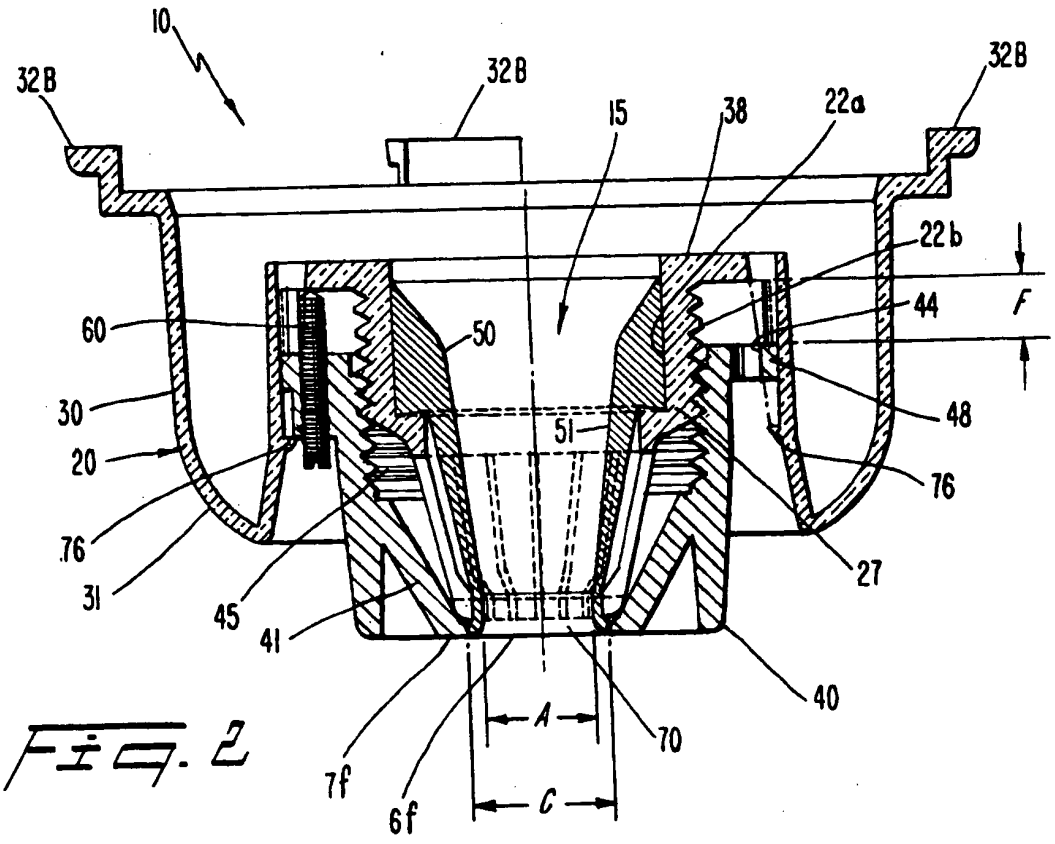


Fig. 2

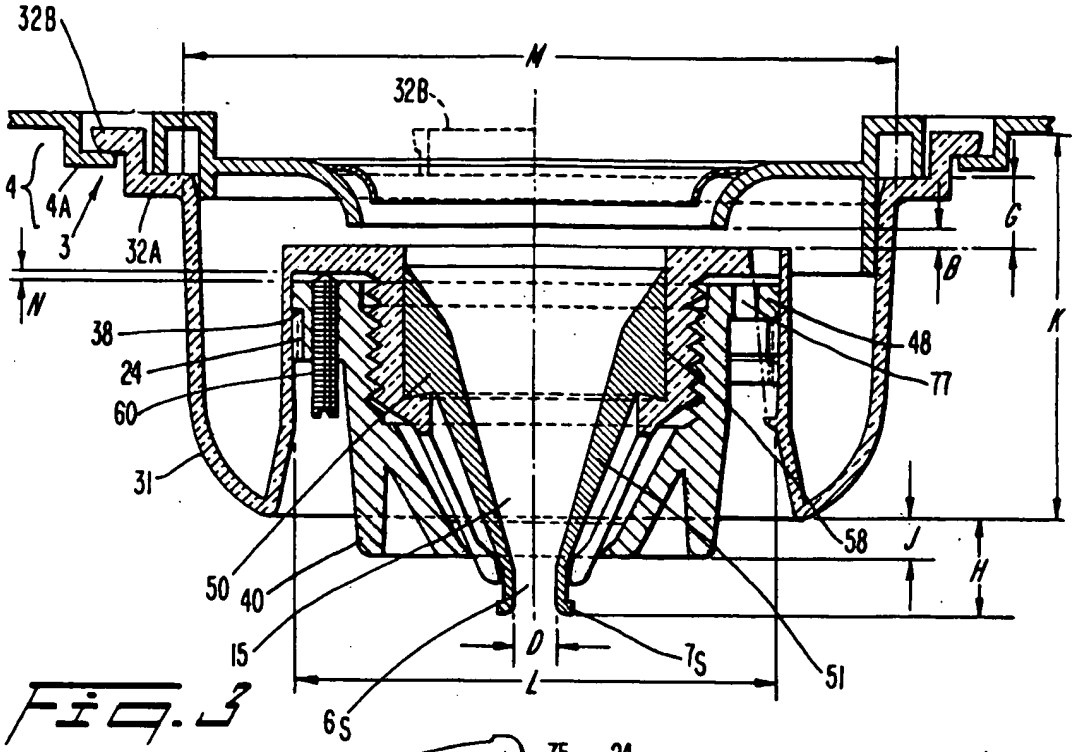


Fig. 3

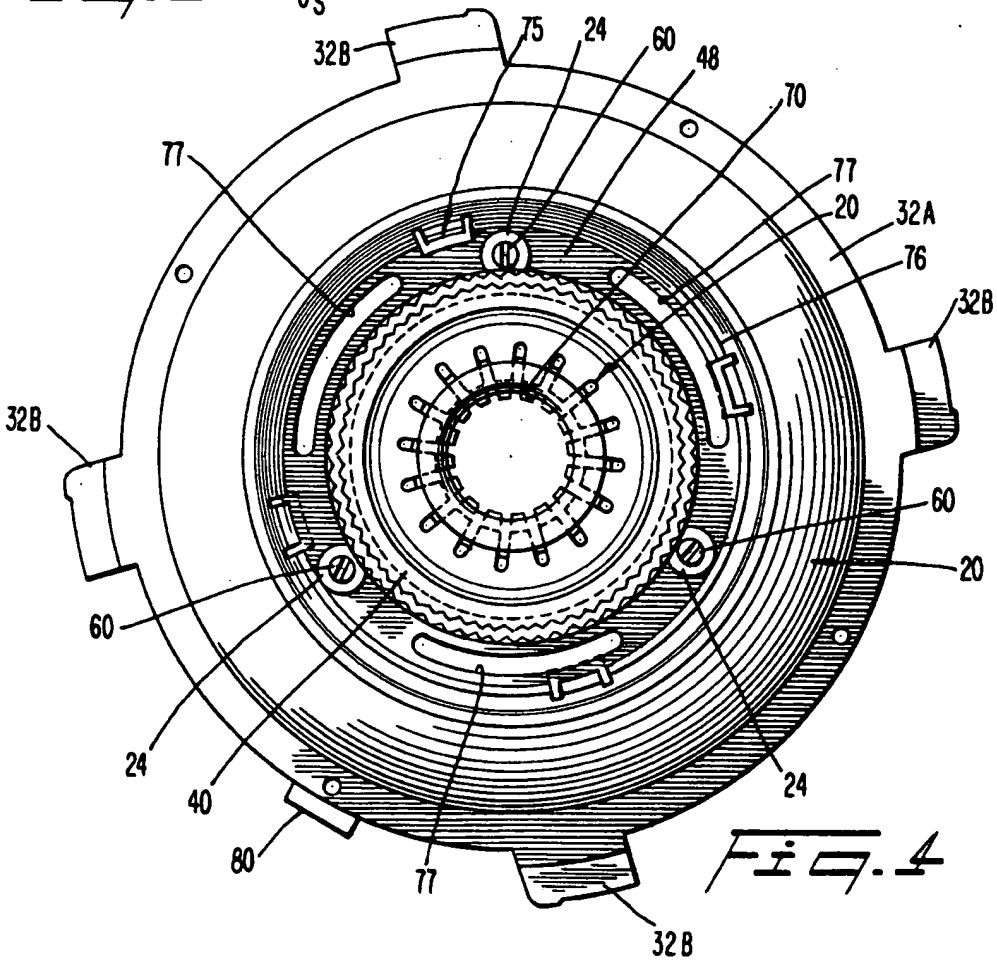


Fig. 4